

Reply to Office Action of 11/02/2005
Amendment Dated: January 27, 2006

Appl. No.: 09/824,844
Attorney Docket No.: CSCO-007/3484

Listing of Claims

1 1 (Previously Amended): A method of processing a command requesting
2 information on any intermediate layer-2 devices present in a route from a first system to
3 a second system, said any intermediate devices being contained in a network implemented
4 on a broadcast medium, said network containing a plurality of devices including said any
5 intermediate devices, said method comprising:

6 receiving said command in a receiving device;

7 sending a request packet from said receiving device to a present layer-2 device
8 requesting information on whether said second system is connected directly to said present
9 layer-2 device;

10 receiving by said receiving device a response packet from said present layer-2
11 device, wherein said response packet indicates whether said second system is connected
12 directly to said present layer-2 device, wherein said response packet further identifies a
13 subsequent layer-2 device in a route from said present layer-2 device to said second system
14 if said second system is not connected directly to said present layer-2 device, wherein said
15 subsequent layer-2 device is next to said present layer-2 device in said route to said second
16 system; and

17 repeating by said receiving device said sending and receiving by using said
18 subsequent layer-2 device in the place of said present layer-2 device until said response
19 packet indicates that said second system is directly connected to said present layer-2
20 device.

1 2 (Currently Amended): The method of claim 1, wherein said receiving device is
2 not directly connected to said first layer-2 device, said method further comprises:

3 locating a directly connected device which is connected directly to said first system;

4 using said directly connected device as said present layer-2 device, wherein said
5 locating and said using are performed before said sending; and

6 performing said repeating in said receiving device to determine said route.

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1 3 (Original): The method of claim 2, wherein said locating comprises:
2 substituting said receiving device as said first layer-2 device; and
3 performing said repeating to determine said directly connected device.

1 4 (Previously Amended): The method of claim 2, wherein said locating comprises
2 sending a multicast packet directed to said plurality of devices, said multicast packet
3 containing an identifier of said first system, wherein each of said plurality of devices is
4 designed to respond indicating if said first system is connected directly to the device.

1 5 (Previously Amended): The method of claim 1, further comprising:
2 determining a first layer-2 device which is connected directly to said first system,
3 logically viewing said first layer-2 device as a present layer-2 device if said second system
4 is also not directly connected to said first layer-2 device;
5 wherein said determining is also performed by said receiving device.

1 6 (Original): The method of claim 5, further comprising providing a command line
2 interface to enable a network administrator to enter said command on said receiving
3 device.

1 7 (Previously Amended): The method of claim 1, wherein said second system is
2 deemed to be directly connected to said first layer-2 device if said second system is
3 connected to a port of said first layer-2 device.

1 8 (Original): The method of claim 7, further comprising:
2 receiving in said receiving device a neighbor packet from a neighbor device on at
3 least one port; and
4 concluding in said receiving device that a system communicating on another port

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5 is connected directly to said another port by the absence of reception of neighbor packets
6 on said another port.

1 9 (Original): The method of claim 8, wherein said network is implemented using
2 Ethernet/802.3 protocol.

1 10 (Original): The method of claim 1, wherein said request packet and said
2 response packet are generated consistent with UDP/IP protocol.

1 11 (Previously Amended): The method of claim 1, wherein said sending, receiving,
2 and repeating are performed in a computer system.

1 12 (Currently Amended): A method of supporting the tracing of a route containing
2 a sequence of layer-2 devices between a first system and a second system, said method
3 being performed in a layer-2 device forming a part of a network, said method comprising:
4 receiving in said layer-2 device a request packet from a central device, said request
5 packet containing an identifier for said second system, wherein said request packet
6 requests information on whether said second system is connected directly to said layer-2
7 device;
8 determining in said layer-2 device whether said layer-2 device is connected directly
9 to said second system;
10 identifying in said layer-2 device a next device if said layer-2 device is not
11 connected directly to said second system, wherein said next device is next to said layer-2
12 device in a route from said first system to said second system;
13 generating in said layer-2 device a response packet, wherein said response packet
14 indicates whether said second system is connected directly to said layer-2 device, said
15 response packet including data identifying said next device if said second system is not
16 connected directly to said layer-2 device; and

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17 sending from said layer-2 device to said central device said response packet
18 irrespective of whether said central device is in said route or whether said layer-2 device
19 is a last device in said route,
20 whereby said central device uses said data identifying said next device to determine
21 said sequence of layer-2 devices.

1 13 (Canceled)

1 14 (Currently Amended): The method of claim 12 ~~13~~, wherein said identifying
2 comprises:
3 examining a table in said layer-2 device to determine a port on which said second
4 system communicates; and
5 locating a device connecting on said port, wherein said located device comprises
6 said next device.

1 15 (Original): The method of claim 14, wherein said locating comprises:
2 receiving a neighbor packet from said next device on said port indicating a next
3 device identifier identifying said next device; and
4 including said next device identifier in said response packet.

1 16 (Previously Amended): The method of claim 15, wherein said first system is
2 deemed to be connected directly to said layer-2 device if said first system is present on a
3 port of said layer-2 device, wherein determining is based on the absence of reception of
4 said neighbor packet on said port.

1 17 (Previously Amended): An apparatus processing a command requesting
2 information on any intermediate layer-2 devices present in a route from a first system to
3 a second system, said any intermediate devices being contained in a network implemented

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4 on a broadcast medium, said network containing a plurality of devices including said any
5 intermediate devices, said apparatus comprising:

6 means for receiving said command in a receiving device;

7 means for sending a request packet from said receiving device to a present layer-2
8 device requesting information on whether said second system is connected directly to said
9 present layer-2 device;

10 means for receiving a response packet from said present layer-2 device, wherein
11 said response packet indicates whether said second system is connected directly to said
12 present layer-2 device, wherein said response packet further identifies a subsequent layer-2
13 device in a route from said present layer-2 device to said second system if said second
14 system is not connected directly to said present layer-2 device, wherein said subsequent
15 layer-2 device is next to said present layer-2 device in said route to said second system;
16 and

17 means for repeating said sending and receiving by using said subsequent layer-2
18 device in the place of said present layer-2 device until said response packet indicates that
19 said second system is directly connected to said present layer-2 device

20 wherein said means for receiving and said means for repeating are also contained
21 in said receiving device.

1 18 (Previously Amended): The apparatus of claim 17, wherein said receiving device
2 is not directly connected to said first layer-2 device, wherein said means for determining
3 further comprises:

4 means for locating a directly connected device which is connected directly to said
5 first system;

6 means for using said directly connected device as said present layer-2 device; and

7 means for performing said repeating to determine said route, said means for
8 performing being contained in said receiving device.

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1 19 (Previously Amended): The apparatus of claim 18, wherein said means for
2 locating comprises:

3 means for substituting said receiving device as said first layer-2 device; and
4 means for performing said repeating to determine said directly connected device.

1 20 (Previously Amended): The apparatus of claim 18, wherein said means for
2 locating comprises sending a multicast packet directed to said plurality of devices, said
3 multicast packet containing an identifier of said first system, wherein each of said plurality
4 of devices is designed to respond indicating if said first system is connected directly to the
5 device.

1 21 (Currently Amended): A layer-2 device for supporting the tracing of a route
2 containing a sequence of layer-2 devices between a first system and a second system, said
3 layer-2 device being comprised in a network based on broadcast medium, said layer-2
4 device comprising:

5 means for receiving in said layer-2 device a request packet from a central device,
6 said request packet containing an identifier for said second system, wherein said request
7 packet requests information on whether said second system is connected directly to said
8 layer-2 device;

9 means for determining in said layer-2 device whether said layer-2 device is
10 connected directly to said second system;

11 means for identifying in said layer-2 device a next device if said layer-2 device is
12 not connected directly to said second system, wherein said next device is next to said layer-
13 2 device in a route from said first system to said second system;

14 means for generating in said layer-2 device a response packet, wherein said
15 response packet indicates whether said second system is connected directly to said layer-2
16 device, said means for generating including data identifying said next device in said
17 response packet if said second system is not connected directly to said layer-2 device; and

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18 means for sending from said layer-2 device to said central device said response
19 packet irrespective of whether said central device is in said route or whether said layer-2
20 device is a last device in said route,
21 whereby said central device uses said data identifying said next device to determine
22 said sequence of layer-2 devices.

1 22 (Canceled)

1 23 (Currently Amended): The layer-2 device of claim ~~21~~²², wherein said means
2 for identifying comprises:

3 means for examining a table in said layer-2 device to determine a port on which
4 said second system communicates; and

5 means for locating a device connecting on said port, wherein said located device
6 comprises said next device.

1 24 (Previously Amended): The layer-2 device of claim 23, wherein said means for
2 locating comprises:

3 means for receiving a neighbor packet from said next device on said port indicating
4 a next device identifier identifying said next device; and

5 means for including said next device identifier in said response packet.

1 25 (Previously Amended): The layer-2 device of claim 23, wherein said first system
2 is deemed to be connected directly to said layer-2 device if said first system is present on
3 a port of said layer-2 device, wherein determining is based on the absence of reception of
4 said neighbor packet on said port.

1 26 (Previously Amended): A computer readable medium carrying one or more
2 sequences of instructions for causing a device to process a command requesting

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information on any intermediate layer-2 devices present in a route from a first system to a second system, said any intermediate devices being contained in a network implemented on a broadcast medium, said network containing a plurality of devices including said any intermediate devices, wherein execution of said one or more sequences of instructions by one or more processors contained in said device causes said one or more processors to perform the actions of:

receiving said command in a receiving device;

sending a request packet from said receiving device to a present layer-2 device requesting information on whether said second system is connected directly to said present layer-2 device;

receiving by said receiving device a response packet from said present layer-2 device, wherein said response packet indicates whether said second system is connected directly to said present layer-2 device, wherein said response packet further identifies a subsequent layer-2 device in a route from said present layer-2 device to said second system if said second system is not connected directly to said present layer-2 device, wherein said subsequent layer-2 device is next to said present layer-2 device in said route to said second system; and

repeating by said receiving device said sending and receiving by using said subsequent layer-2 device in the place of said present layer-2 device until said response packet indicates that said second system is directly connected to said present layer-2 device.

27 (Previously Amended): The computer readable medium of claim 26, wherein said receiving device is not directly connected to said first layer-2 device, further comprises:

locating a directly connected device which is connected directly to said first system;

using said directly connected device as said present layer-2 device, wherein said

locating and said using are performed before said sending; and

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7 performing said repeating in said receiving device to determine said route.

1 28 (Original): The computer readable medium of claim 27, wherein said locating
2 comprises:

3 substituting said receiving device as said first layer-2 device;

4 third performing said repeating;

5 using a last one of said present-layer 2 determined by said third performing as said
6 directly connected device.

1 29 (Previously Amended): The computer readable medium of claim 27, wherein
2 said locating comprises sending a multicast packet directed to said plurality of devices,
3 said multicast packet containing an identifier of said first system, wherein each of said
4 plurality of devices is designed to respond indicating if said first system is connected
5 directly to the device.

1 30 (Currently Amended): The computer readable medium of claim 26, further
2 comprising one or more sequences of instructions for:

3 determining a first layer-2 device which is connected directly to said first system,
4 logically viewing said first layer-2 device as a present layer-2 device if said second system
5 is also not directly connected to said first layer-2 device;

6 wherein said determining, sending, receiving, and repeating are performed by said
7 receiving device.

1 31 (Currently Amended): The computer readable medium of claim 30, further
2 comprising one or more sequences of instructions for providing a command line interface
3 to enable a network administrator to enter said command on said receiving device.

1 32 (Previously Amended): The computer readable medium of claim 26, wherein

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2 said second system is deemed to be directly connected to said first layer-2 device if said
3 second system is connected to a port of said first layer-2 device.

1 33 (Currently Amended): The computer readable medium of claim 32, further
2 comprising one or more sequences of instructions for:

3 receiving in said receiving device a neighbor packet from a neighbor device on at
4 least one port; and

5 concluding in said receiving device that a system communicating on another port
6 is connected directly to said another port by the absence of reception of neighbor packets
7 on said another port.

1 34 (Original): The computer readable medium of claim 33, wherein said network
2 is implemented using Ethernet/802.3 protocol and said request packet and said response
3 packet are generated consistent with UDP/IP protocol.

1 35 (Currently Amended): A computer readable medium carrying one or more
2 sequences of instructions for causing a layer-2 device to support the tracing of a route
3 containing a sequence of layer-2 devices between a first system and a second system, said
4 layer-2 device being comprised in a network based on broadcast medium, wherein
5 execution of said one or more sequences of instructions by one or more processors
6 contained in said layer-2 device causes said one or more processors to perform the actions
7 of:

8 receiving in said layer-2 device a request packet from a central device, said request
9 packet containing an identifier for said second system, wherein said request packet
10 requests information on whether said second system is connected directly to said layer-2
11 device;

12 determining in said layer-2 device whether said layer-2 device is connected directly
13 to said second system;

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14 identifying in said layer-2 device a next device if said layer-2 device is not
15 connected directly to said second system, wherein said next device is next to said layer-2
16 device in a route from said first system to said second system;

17 generating in said layer-2 device a response packet, wherein said response packet
18 indicates whether said second system is connected directly to said layer-2 device, said
19 response packet including data identifying said next device in said response packet if said
20 second system is not connected directly to said layer-2 device; and

21 sending from said layer-2 device to said central device said response packet
22 irrespective of whether said central device is in said route or whether said layer-2 device
23 is a last device in said route,

24 whereby said central device uses said data identifying said next device to determine
25 said sequence of layer-2 devices.

1 36 (Canceled)

1 37 (Currently Amended): The computer readable medium of claim 3536, wherein
2 said identifying comprises:

3 examining a table in said layer-2 device to determine a port on which said second
4 system communicates; and

5 locating a device connecting on said port, wherein said located device comprises
6 said next device.

1 38 (Original): The computer readable medium of claim 37, wherein said locating
2 comprises:

3 receiving a neighbor packet from said next device on said port indicating a next
4 device identifier identifying said next device; and

5 including said next device identifier in said response packet.

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1 39 (Currently Amended): A device for supporting the tracing of a route containing
2 a sequence of layer-2 devices between a first system and a second system, said device
3 being comprised in a network based on broadcast medium, said device comprising:

4 an inbound interface receiving a request packet from a central device, said request
5 packet containing an identifier for said second system, wherein said request packet
6 requests information on whether said second system is connected directly to said device;

7 a next hop block determining whether said device is connected directly to said
8 second system, said next hop block identifying a next device if said layer-2 device is not
9 connected directly to said second system, wherein said next device is next to said layer-2
10 device in a route from said first system to said second system;

11 a generate request/response block generating a response packet, wherein said
12 response packet indicates whether said second system is connected directly to said device,
13 said response packet including data identifying said next device if said second system is
14 not connected directly to said layer-2 device; and

15 an outbound interface sending said response packet to said central device
16 irrespective of whether said central device is in said route or whether said device is a last
17 device in said route.

1 40 (Previously Amended): The layer-2 device of claim 39, further comprising:

2 a memory storing a first table and a second table, said first table indicating a port
3 on which each system communicates, said second table indicating a device connecting to
4 each port; and

5 a port determination block determining a port on which said second system
6 communicates,

7 wherein said next hop block examines said second table to determine said a next
8 device according to the port determined by said port determination block, wherein said
9 next device is contained in said sequence of layer-2 devices.

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1 41 (Previously Amended): The layer-2 device of claim 40, wherein said next hop
2 block determines that said second system is directly connected to a first port indicated by
3 said first table if no device is associated with said first port in said second table.

1 42 (Previously Amended): The layer-2 device of claim 39, further comprising an
2 user interface receiving a trace command from a network administrator.

1 43 (Previously Amended): The layer-2 device of claim 42, wherein said layer-2
2 device is not directly connected to said first system, said layer-2 device further comprising
3 a control logic to trace a directly connecting device connecting directly to said first system,
4 wherein said route is traced from said directly connecting device using said inbound
5 interface, said outbound interface, said next hop block and said generate request/response
6 block.

1 44 (Previously Amended): The layer-2 device of claim 42, wherein said layer-2
2 device is not directly connected to said first system, said layer-2 device further comprising
3 a control logic to trace a directly connecting device connecting directly to said first system
4 by sending a multicast packet.

1 45 (Previously Amended): The layer-2 device of claim 39, further comprising a
2 response processor to receive a response packet, wherein said response packet indicates
3 a next device in said route, wherein said generate request/response block generates another
4 request packet directed to said next device, wherein said another request packet requests
5 said next device to indicate whether said second system is connected directly to said next
6 device.